

**July 5, 2004**

## **IODP EXPEDITION 301: JUAN DE FUCA HYDROGEOLOGY WEEK 1 REPORT**

### **OPERATIONS**

The Astoria port call leading up to Expedition 301 was extensive due to all the activities required to remobilize the JOIDES Resolution for IODP operations. The mobilization process began in Gamagori, Japan with the official acceptance of the drill ship JOIDES Resolution on 31 May 2004. Some limited loading activities were conducted after acceptance. Lab equipment, supplies, and computers required for bringing the shipboard labs back to operational status were loaded, as was a limited amount of drilling equipment. The active heave compensator (AHC) was serviced. Activities conducted during the transit included oversight of a variety of subcontractor projects required to prepare the ship for operations, installation and configuration of computer systems, and installation and testing of lab equipment.

**Astoria Port Call:** After the 17 day transit across the Pacific Ocean the ship arrived in Astoria on the 18 June ~1.5 days ahead of schedule. Approximately 40 truckloads of equipment were used to deliver the materials required for remobilization and Expedition 301 to Astoria. Items loaded included drill pipe, all bulk materials (mud and cement), casing, all remaining operations drilling equipment, a new heave compensated logging line/winch, lab equipment and supplies, and all of the specialty hole completion equipment required for replacing two existing CORKS and installing two new CORK systems. The Astoria port call was scheduled for 8 days, but was completed in just over 7 days.

**Transit to Site 1301 (SR-1A):** The ship departed Astoria at 0833 hr 27 June, the pilot disembarked via helicopter and at 1030 hr we were underway to Site 1301 (SR-1A). After the 172 nmi transit (16.6 hr), we reduced speed, and began dynamic positioning over Site 1301 (SR-1A) at 0321 hr 28 June.

**Site 1301, Hole 1301A:** 47° 45.2095' N, 127° 45.8329' W, Seafloor depth 2667.5 mbrf: The ship was offset ~15 m and we conducted a jet-in test in to determine how much 20 inch casing to deploy with the reentry cone. After verifying the seafloor depth with the TV/sonar system (2667.5 mbrf), we jetted in the bit to 41.4 mbsf in 5.75 hrs. The jetting-in of the reentry cone and 20 inch casing to 39.1 mbsf took 7 hours. To prepare the hole for 16 inch casing, we opened the hole to ~21 inches using an underreamer in the sediment (0 to 262.4 mbsf) and then an eccentric bit in the upper basaltic basement (262.4 to 271.5 mbsf). The reentries for each of these bit runs took ~5 min. We then assembled 16 inch casing, reentered Hole 1301A (~10 min), lowered the casing shoe to 261.5 mbsf, and cemented it in place. Our next step was to drill a 14.75 inch hole into upper basaltic basement for the 10.75 inch casing.

After another ~5 min reentry, we lowered the bit to the top of cementing assembly at the base of the 16 inch casing, commenced drilling out the cement wiper plug/dart/float shoe assembly and cement, and continued drilling ahead. As of 1700 hr 4 July (Sunday) we have penetrated to over 80 m below the initial basement contact.

## **SCIENTIFIC RESULTS**

IODP Expedition U301 is part of a multidisciplinary experiment to evaluate formation-scale hydrogeologic properties (transmission, storage) within oceanic crust; determine how fluid pathways are distributed within an active hydrothermal system; establish linkages between fluid circulation, alteration, and geomicrobial processes; and determine relations between seismic and hydrologic anisotropy. During IODP Expedition U301, we will replace two existing seafloor observatories (at Holes 1026B and 1027C), and install two new observatories, creating a three-dimensional monitoring network. We will also core and sample basaltic upper crust and overlying sediments to assess physical, geochemical, and microbiological conditions, and complete a series of downhole experiments to assess hydrogeologic properties near the new boreholes. An additional basement hole will be drilled during a later expedition, allowing completion of controlled, long-term, cross-hole testing. Collectively, these operations and experiments will allow us to evaluate the extent to which oceanic crust is connected vertically and horizontally; the influence of these connections on fluid, solute, heat, and microbiological processes; and the importance of scaling on hydrologic properties. We will complete this work where (1) thick sediment cover isolates permeable basement, allowing small pressure transients to travel long lateral distances, (2) outstanding coverage of seismic, heat flow, coring, geochemical, and observatory data allow detailed hypotheses to be posed and tested, (3) existing ODP drill holes and long-term observatories provide critical monitoring points for pre- and post-drilling experiments, (4) the formation is naturally overpressured so as to drive multi-year, cross-hole experiments (5) and a planned, cabled seafloor observatory network will facilitate long-term experiments, data access, and instrument control.

As the first week has consisted only of drilling operations, we spent this week organizing the scientific team, conducting shipboard planning for the borehole installations, as well as preparing scientific research, sampling, and laboratory plans.

## **EDUCATION**

A middle school educator is sailing on Expedition 301 via the Teacher-at-Sea program. The teacher has been participating in all science activities and interacting with scientists, technical staff, and ships crew. The teacher has been keep a daily journal (text and photo; the first week of which will posted on the web shortly) as well is starting to develop lab briefs for teachers and students at middle-high school level.

## **TECHNICAL SUPPORT AND HSE ACTIVITIES**

The technical group assisted with loading and distribution of laboratory and scientific equipment and supplies during the Astoria port call. The new technicians have been learning their labs and all technical staff have been preparing lab equipment for operation in conjunction with the science party. The electronic technicians assisted with troubleshooting the ICP bead maker, the pycnometer, rig instrumentation system, and the MST P-wave logger. ET's are working to resolve depth cursor problems on the 3.5HZ recorder and a sticking thermostat driven valve controlling chill water flow to the cryogenic magnetometer. Downhole tools are being assembled and pressure tested and we are providing support to scientists preparing CORK instrument packages. Equipment for microbiology contamination testing (PFT pump) was installed in the mudroom and tested. Curator efforts have been focused on working with the science party to prepare the working sampling plan and laboratory core flow. Core sampling classes are being conducted. System Analyst efforts have been focused on ensuring database and web-query functionality, trouble-shooting

MST software, and fine-tuning curation software. The Computer System managers have been busy ensuring functionality of all hardware, software, and communications systems. Only fine-tuning required for full operational capability. Computer, communication, and database system presentations have been given to the science party. The new IODP-USIO Ship/Shore Communication policy was distributed to all shipboard participants.

Core recovery: None

Samples collected: None

HSE. A fire and boat drill was conducted 2 July to familiarize new personnel with the location of their lifeboat. The technical staff joined other non-assigned personnel at the lifeboats. A lab safety session was conducted 1 July for the scientists working on the focsle deck. The technical staff has reviewed the required TAMU-HR Sexual Harassment video. Life jackets are being surveyed by TSF for functionality.